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Publication date:
2011

Document Version
Early version, also known as pre-print

26th Fungal Genetics Conference, Asilomar, California, USA, 14/3-20/3 2011

Poster (abstract):

Fumonisins in *Aspergillus niger*: Industrial and food aspects

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Introduction:

Fumonisins are toxic seconday metabolites from *Fusarium verticillioides* and other Fusaria, from *Tolypocladium* and *Aspergillus niger* [1,2]. Being a generalist *Aspergillus niger* is the workhorse in a very large number of industrial applications, and is also a common contaminant in foods. Fumonisin production by *A. niger* is depending on temperature and water activity, but is produced mostly on substrates with high maounts of sugar or salt [1,3,4]. We wanted to find out whether industrial strains could produce fumonisins in worst case scenarios and if fumonisin production was only a feature of few black aspergilli or of widespread occurrence.

Methods

The black aspergilli were grown on CYAS and YES media for 7 days at 25° C in darkness. Small agar plugs were extracted with 75% MeOH, filtered, and analyzed by gradient HPLC-MS.

Results and discussion:

All publications describing industrial applications of *A. niger* were scrutinized and approximately half of the strains used were not available for the scientific community. The other strains were available, and few of them proved to be *A. tubingensis*, *A. acidus*, *A. carbonarius* or *A. brasiliensis*. Among the real *A. niger* strains, nearly all strains ever used in biotechnology could produce fuminisins B_2, B_4 & B_6. The strains could be subdivided into two clades (representing *A. niger* and the "phylospecies" *A. awamori*), and there were fumonisin producers in both clades. Ochratoxin A was also produced by strains in both clades, but only of approximately 6% of the strains. None of the other species in the black Aspergilli produced fumonisins. One strain (NRRL 337), called the "food fungus", because it is used for single cell protein based on cheap growth substrates, produced both fumonisins and ochratoxin A. Industrial citric acid producers produced fumonisins in pure culture, so we tested whether they could produce fumonisins on citric acid production media in shake flasks, and they could indeed produce small amounts of fumonisins.

Conclusions:

Most strains of *Aspergillus niger* can produce fumonisins. In order to have entirely safe production conditions there are several possibilities:

- The gene clusters responsible for fumonisin and ochratoxin A production can be inactivated
- A non-toxigenic strain of *A. niger* can be used for industrial applications
- A closely related species can be used industrially, fx *A. brasiliensis, A. vadensis, A. acidus*, or *A. tubingensis*, as they are not able to produce fumonisins or ochratoxins
- The fumonisin producing strains of *A. niger* can be grown under conditions, where fumonisin accumulation is not possible, but in that case a strict scheme for daily chemical control is necessary. This practice is used for *Fusarium venenatum*, used for single cell protein (Quorn). This fungus can produce trichothecenes under optimal conditions.

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